PATENT SPECIFICATION

662,307

Date of Application and filing Complete Specification: Aug. 11, 1949.
No. 20932/49.
Application made in United States of America on Sept. 1, 1948.
Complete Specification Published: Dec. 5, 1951.

Index at acceptance :—**Classes 80(ii)**, C1c(2 : 4b : 10), P4 ; **and 103(i)**, E2(14 : m2a3), E2m2b5(a2 : d2), E2m2e(2 : 5b2), E(2m2f3 : 4).

COMPLETE SPECIFICATION

Clutch and Brake Structure

We, THE CLEVELAND PUNCH & SHEAR WORKS CO., a corporation duly organized under the laws of the State of Ohio, of 3917, St. Clair Avenue, Cleveland, State of Ohio, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to clutch and brake mechanism for power presses and other driven machines with continuously driven fly-wheels—which machines through clutch mechanism transmit rotary motion and energy of their driven fly-wheels to parts to be driven and arrest the motion of the driven parts by brake mechanism actuated when the clutch mechanism is inactive—and is an improvement over our co-pending Applications No. 11929/48, filed April 30, 1948, and No. 18821/48, filed July 13, 1948 (Serial Nos. 653,661 and 653,579), which provide clutch and brake mechanism having lever actuated unitary clutch and brake shoe members adapted to be selectively shifted in opposite directions for selective clutching and braking action of the unitary clutch and brake shoe members.

The primary object of the present invention is the provision of a combined clutch and brake mechanism for machines of the type referred to above, which mechanism includes individual shiftable clutch shoe members, individual, spring biased brake shoe members, and supporting and shifting means mounting and actuating both the clutch shoe members and the brake shoe members, the supporting and shifting means being pivotally supported and constructed to effect selective clutching and braking action of the shoe members when the supporting and shifting means are shifted on their pivots in opposite directions.

Another object of the invention is the provision of a combined clutch and brake mechanism for machines of the type referred to above, which mechanism includes individual, substantially radially shiftable clutch shoe members ; individual, substantially radially shiftable spring biased brake shoe members ; and, pivotally supported shifting means having eccentric portions rotatably coupled with said clutch and brake shoe members, the eccentric portions being offset with respect to each other to effect selective clutching and braking action of the shoe members when the shifting means are shifted on their pivots in opposite directions.

A further object of the invention is the provision of a combined clutch and brake mechanism for machines of the type referred to above, which mechanism includes individual, substantially radially shiftable clutch shoe members ; individual, substantially radially shiftable spring biased brake shoe members ; and, fluid operated dual lever means having eccentric portions rotatably mounting the clutch shoe members and brake shoe members, the dual lever means when shifted in either direction being adapted to effect shifting of the clutch shoe means in one direction and shifting of the brake shoe means in the opposite direction to effect selective action of the clutch and brake shoe means for selective clutching or braking purposes.

With these and incidental objects in view which will appear hereinafter, the invention consists in certain other novel features of construction and combination of parts, the essential elements of which are set forth in the appended claims ; and a preferred form of embodiment of the invention is hereinafter shown with reference to the drawings accompanying and forming part of the specification.

In the drawings :—

Figure 1 is a transverse, sectional view taken perpendicular to the axis through a fluid-operated clutch and brake mechanism constructed in accordance with the invention, the mechanism being shown attached to

and coupled with the driven shaft and fly-wheel of a power-driven machine, such as a power press, the section being taken on line 1–1 of Figure 2 of the drawings;

Figure 2 is a longitudinal, cross-sectional view through the fluid-operated clutch and brake mechanism shown in Figure 1, the section being taken on line 2–2 of Figure 1;

Figure 3 is a fragmentary view on line 3–3 of Figure 1;

Figure 4 is a side view of a clutch shoe member;

Figure 5 is a cross-sectional view on line 5–5 of Figure 4;

Figure 6 is a side view of a brake shoe member;

Figure 7 is a side view of an actuating lever pivotally mounting a clutch and a brake shoe member;

Figure 8 is a bottom view of the actuating lever shown in Figure 7;

Figure 9 is a side view of a pin member pivotally connecting an actuating lever with the base member of the clutch and brake mechanism; and

Figure 10 is an end view of the pin member shown in Figure 9.

Referring now in detail to the exemplified form of the invention shown in the drawings, reference numeral 2 denotes the crank-shaft of a power-driven machine such as a power press, which shaft freely rotatably mounts in ball bearings 3 and 4 a fly-wheel 5 driven in any suitable manner. Fly-wheel 5 has attached to its rim portion 6, secured thereto by screw members 8, a circumferential flange member 7, which flange member has angular cross section and forms a clutch drum 9 for a clutch and brake mechanism 10 mounted on crank-shaft 2. The clutch and brake mechanism includes two oppositely-arranged shiftable clutch shoe members 11 and two oppositely-arranged shiftable brake shoe members 12. Clutch shoe members 11, which are of substantially T-shaped cross section, include each a web portion 14 and a circular, arc-like flange 15 integrally extended from said web portion and co-operating in clutching operations with the inner surface of clutch drum 9 on fly-wheel 5, and brake shoe members 12 which are of substantially T-shaped cross section include each a web portion 16 and a circular arc-shaped flange 17 co-operating with the inner surface of a brake drum 18 secured to the frame of the power-driven machine by bolts 19.

The clutch shoe members 11 and the brake shoe members 12 which are of substantially equal construction with the exception that the radii of the arcs of the clutch shoe members are somewhat larger than the radii of the arcs of the brake shoe members for a purpose later to be described, have their circular arc-like flanges 15 and 17 lined with brake-lining 13 to insure the desired clutching and braking action with clutch drum 9 and brake drum 18, respectively. Clutch shoe members 11 and brake shoe members 12 are co-ordinated to each other and shiftably coupled with a base member 20 by actuating levers 21, which are pivotally connected to base member 20 by pin members 22 extended through bores 23 in the actuating levers and ear portions 24 of fork-shaped extensions 25 on base member 20. These levers each include a central portion 26, lever arms 27, 28 and circular eccentric studs 29, 30 extended from central portion 26 laterally to lever arms 27 and 28. The eccentric studs 29 and 30 of each actuating lever 21 are eccentrically arranged with respect to the axis of bore 23 in symmetrical relation with respect thereto. Circular stud 29 rotatably supports a single clutch shoe member 11 and circular stud 30 rotatably supports a single brake shoe member 12. For such purpose clutch and brake shoe members 11 and 12 are provided with bearing portions 31, 32 which are lined with bearing sleeves 33 fitting the circular eccentric studs 29 and 30.

A pivotal movement of each pivotally-supported actuating lever 21 effects shifting of the respective clutch and brake shoe members in opposite directions into and out of engagement with clutch drum 9 and brake drum 18. This pivotal movement of an actuating lever is effected by a fluid-operated shifting device 34 which is coupled with the lever arm 27 and a spring assembly 35 which is coupled with lever arm 28. Lever arm 27 is slightly longer than lever arm 28 and is linked to piston 36 of the fluid-operated shifting device 34, having its cylinder 37 formed as an integral part of base member 20. Shifting of the fluid-operated device is effected in one direction when fluid enters cylinder 37 through a passage 38 in the bottom wall of said cylinder. This passage is in open communication with a bore 39 in shaft 2 and permits feeding of fluid into cylinder 37 so as to force piston 36 outwardly and effect outward movement of clutch shoe member 11 by eccentric stud 29 and into clutching engagement with clutch drum 9, and inward shifting of brake shoe member 12 to release its braking engagement with brake drum 18. The lever arm 28 is pivoted to the compression spring assembly 35 to effect compression of the spring assembly in the above-described movement.

The compression spring assembly 35 effects shifting of actuating lever 21 in an opposite direction when the fluid pressure in cylinder 37 is released and fluid contained in said cylinder is permitted to be discharged therefrom through passage 38 and bore 39 in any suitable manner. This spring assembly

is pivoted to lever arm 28 by pin 40 extended through a clevis 41 and lever arm 28 and embodies an elongated compression spring 42 which is seated between said clevis and an L-shaped slotted bracket 43 attached to base member 20 by bolts 44. A guide rod 45, threadably engaged with clevis 41, carries at its free end an elongated nut member 46 which is slidably extended through a slot 47 in bracket 43. Guide rod 45 is formed with an enlargement 48 permitting proper guiding of the pre-compressed compression spring 42.

In order that each brake shoe be urged or biased toward the braking surface 18, each spring 45 has a length in the unstressed condition which is greater than the span which exists between bracket 43 and clevis 41 when the mechanism is in braking position. Hence, when the spring assembly is put into place, the spring 43 must be compressed to position it between clevis and bracket, whereby the spring is pre-compressed, that is, under compression even prior to the clutch engaging action which shifts the lever mechanism against the spring to compress it further. The length of spring is chosen in view of its elastic characteristics so as to develop the desired braking force or bias when compressed between bracket and clevis upon assembly of the mechanism.

The clutch and brake mechanism described is particularly well suited for high-speed punch presses and other machines rotating their moving parts at more than 400 r.p.m., as the power necessary for quick and proper braking action is proportionate to the centrifugal force created by rotation of the mechanism, so that relatively light springs may readily be used in the compression spring assembly to decrease the counter-acting forces of the spring assembly during shifting of the clutch and the brake shoe members from clutching action to braking action.

In operation, when the described clutch and brake mechanism is used as described on a power press with a crank-shaft 2, fly-wheel 5, according to common practice is continuously driven by a motor pulley and belt arrangement (not shown). Starting of the press is effected by feeding fluid into cylinder 37 to shift piston 36 and therewith rotate actuating lever 21 in anti-clockwise direction, Figure 1, against the force of pre-compressed spring assembly 35. The pivots for such movement of levers 21 are pins 22 pivoting levers 21 to base member 20 rigidly mounted on crank-shaft 2 by a key member 49. This movement of levers 21 effects outward movement of the clutch shoe members 11 for frictional clutching engagement with the clutch drum 9 and inward movement of brake shoe members 12 for release of their braking action with brake drum 18. The clutching engagement transfers the rotary movement of fly-wheel 5 through clutch shoe members 11 to crank-shaft 2 by means of actuating levers 21, pin members 22 and base member 20 to crank-shaft 2. In the clutching position of the mechanism the brake shoe members 12 have their lined flanges 17 disengaged from frictional contact with brake drum 18 and pre-compressed compression springs 42 are additionally compressed. Disengagement of the clutching action of the clutch shoe members 11 with clutch drum 9 is automatically effected by release of the pressure fluid from cylinder 37. Such a release may be induced in any customary manner and permits compression springs 42 to rotate the actuating lever 21 in a clockwise direction to effect shifting of the clutch shoe members inwardly and out of frictional clutching contact with the clutch drum and shifting of the brake shoe members outwardly into frictional braking contact with the brake drum so as to stop rotation of base member 20 and the crank-shaft 2 mounting same.

The radii of the circular arc-like flanges 15 of the clutch shoe members 11 are somewhat larger than the radii of the flanges 17 of the brake shoe members 12 to permit quick and efficient assembly and disassembly of the clutch and brake mechanism for repair work.

To avoid tilting and dragging of the shoe members when disengaged from their respective clutch and brake drums, each shoe member carries in its web portion 14 and 16, respectively, near the central bottom portion thereof, a guide pin 50 having its grooved or slotted head 51 engaged by a spring-pressed plunger 52 which is mounted in the pin-supporting ear portions 24 of the fork-shaped extension 25 on base member 20.

Adjustment of the clutch and brake mechanism in case of wear of the brake linings 13 on clutch and brake shoes 11 and 12 is readily effected by rotation of pin 22. For such purpose, pin 22 includes a central eccentric portion 53 fitting the bore 23 in actuating lever 21 and adapted to effect by rotation of the pin 22 outward shifting of the respective actuating lever 21 to bring the clutch and brake shoes back into proper position for efficient and quick clutching and braking operations.

To facilitate the adjustment of the brake and clutch mechanism by the rotational positioning of pin member 22, the shouldered end 54 of the pin outside of the ear 24 carries an arm 55 secured against rotation relative to the pin member, by a key or transverse pin, for example. A bolt 56, passed through a bolt hole 57 in the arm 55 and threaded into one of a series of threaded holes 58 provided in ear 24, secures the arm and pin 22, and hence the brake and clutch shoes, in adjusted position. Hence

as wear takes place in the friction surfaces, the take-up adjustment is made by loosening the bolt, moving the arm to another one of the holes 58 and then running the bolt into the selected hole to secure the arm and pin in the adjusted position.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

1. A clutch and brake mechanism for driven machines with a continuously-rotating driving member mounted to rotate on a driven shaft of the machine, including a driven member fixedly mounted to the shaft to rotate therewith, means on the said rotating driving member affording a clutching surface co-axial with the said shaft, means affording a braking surface co-axial with the said shaft, radially shiftable clutch friction shoe means adapted upon outward shifting to engage said clutching surface, radially shiftable brake friction shoe means adapted upon outward shifting to engage said braking surface, and a lever structure pivotally connected to said driven member with the axis of pivoting parallel to the axis of said shaft and pivotally supporting said clutch and brake shoe means, said lever structure having a body with lever arm means extending therefrom substantially radially to the axis of pivoting of said lever structure and adapted to be coupled to actuating means, said lever structure also having a pair of eccentric cylindrical portions symmetrically offset with respect to the lever structure pivot axis for pivotally mounting respectively said clutch and brake shoe means to effect, by rocking of said lever structure on its pivot, substantially radial shifting of said friction shoe means in opposite directions with respect to each other for selective engagement of the clutch and brake shoe means respectively with said clutching surface and said braking surface.

2. A clutch and brake mechanism as set forth in Claim 1, including co-operating guiding means on said friction shoe means and said driven member adapted to prevent tilting of said friction shoe means with respect to said driven member.

3. A clutch and brake mechanism as set forth in Claim 2, in which said guiding means includes pin members rotatably mounted in said friction shoe means and having heads provided with a guide slot, and spring-pressed plungers supported by said driven member and extended into the slotted heads of said pin members.

4. A clutch and brake mechanism as set forth in Claim 1, in which said lever structure includes a body having an axial pivot bore for pivotally connecting the body to said driven member, two arm portions extending from opposite sides of said body portion adapted to be coupled to actuating devices, and two eccentric cylindrical stud portions extending from said body in symmetrical, parallelly offset arrangement with respect to its axial bore and having pivotally mounted thereon the friction shoe members.

5. A clutch and brake mechanism as set forth in Claim 1, including actuating means coupled with said lever structure and adapted to rock said lever structure on its pivot in opposite directions to shift said friction shoe means in opposite directions.

6. A clutch and brake mechanism as set forth in Claims 4 and 5, in which said actuating means includes fluid-operated means and piston means coupled to one of said arm portions and pre-compressed spring means coupled with the other of the said arm portions to shift said friction shoe members in selected opposed directions.

7. A clutch and brake mechanism as set forth in Claims 1 and 5, including a plurality of symmetrically-arranged clutch friction shoe members co-operating with the driving member, a plurality of symmetrically-arranged brake friction shoe members co-operating with the braking surface, a plurality of symmetrically-arranged lever structures, and a plurality of actuating means therefor.

8. A clutch and brake mechanism as set forth in Claim 1, in which said driven member has a yoke-shaped extension, said lever structure being pivoted on a pin between the arms of the extension, said pin being rotatably adjustably mounted in the arms of said extension and including an eccentric portion extended through a bore in the lever structure and adapted to shift same radially by rotation of said pin, and means adapted to secure said pin in adjusted rotational position.

9. A clutch and brake mechanism as set forth in Claim 1, for power-driven machines having a continuously-driven fly-wheel, a frame, and a shaft rotatably mounting said fly-wheel, including as a clutching surface a clutch drum secured to said fly-wheel, and as a braking surface a brake drum secured to said frame.

10. A clutch and brake mechanism for power-driven machines as set forth in Claim 9, in which the clutch drum is an open ring larger in diameter than the brake drum and removably secured to the rim of the fly-wheel to permit lateral shifting of the clutch drum and an exposure of the friction shoe member for the clutch drum by sliding the said clutch drum over the brake drum, the brake drum also being an open ring removably secured to a flange of the frame to permit its lateral shifting for exposure of the friction shoe member for the brake drum.

11. A clutch and brake mechanism for power presses and other driven machines with a continuously-rotating driving member substantially as shown and described and for the purpose set forth.

Dated this 11th day of August, 1949.

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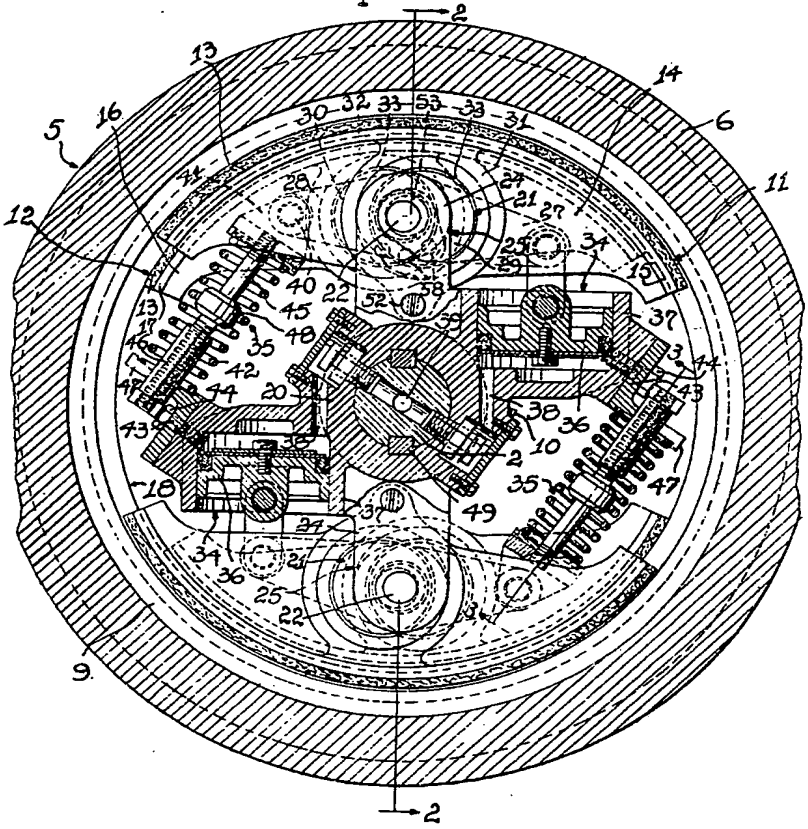
(1016) Exeter : Printed for His Majesty's Stationery Office, by James Townsend & Sons, Ltd.—1951.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2*s.* per copy ; by post 2*s.* 1*d.* may be obtained.

FIG. 1



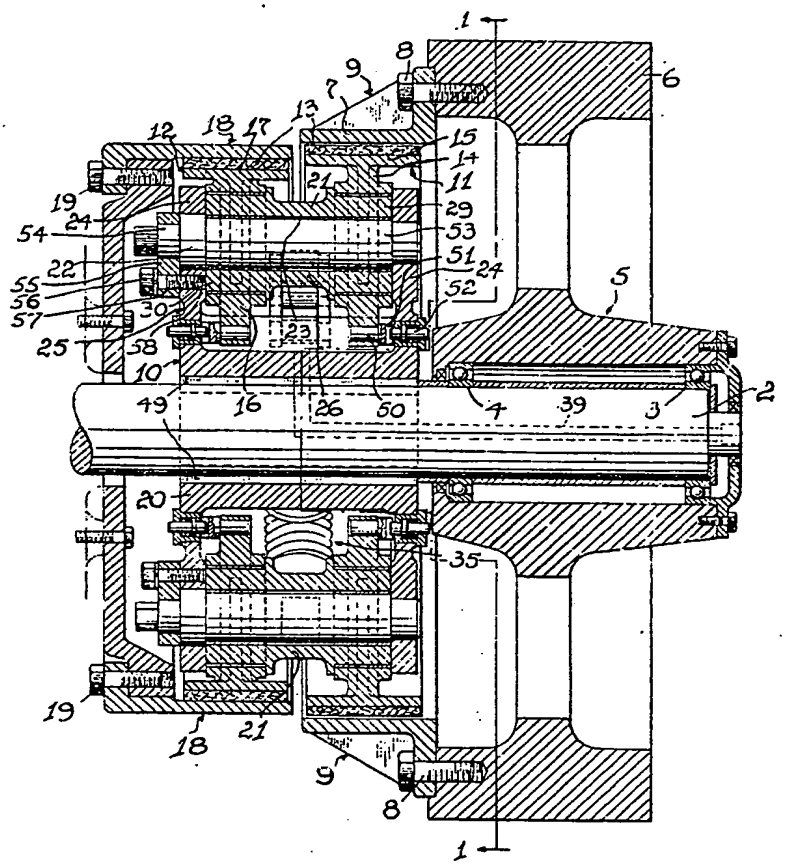


FIG. 2

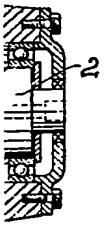
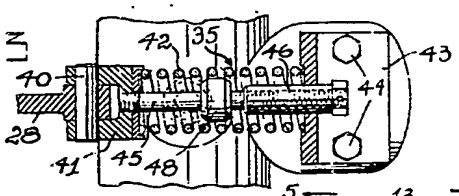


FIG. 3



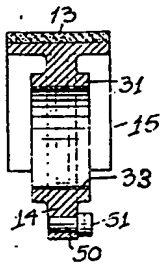
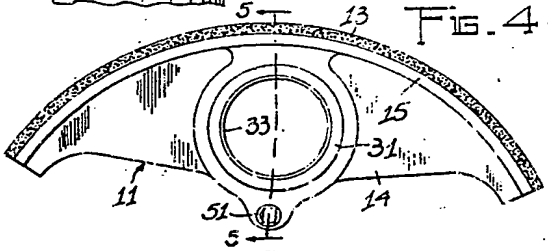


FIG. 5

FIG. 4



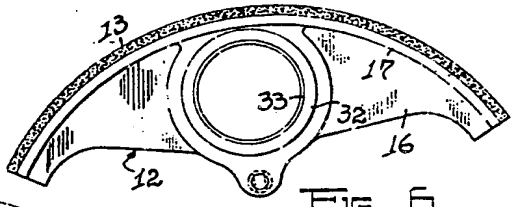
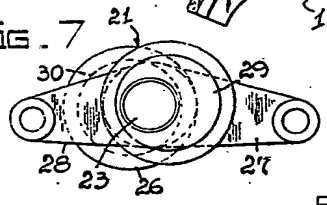


FIG. 6

FIG. 7



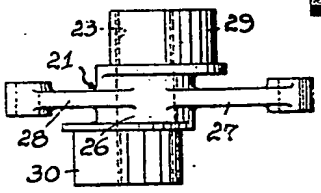


FIG. 8

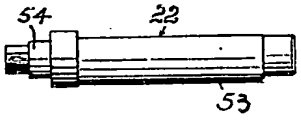


FIG. 9

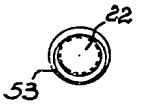


FIG. 10

SHEET 2

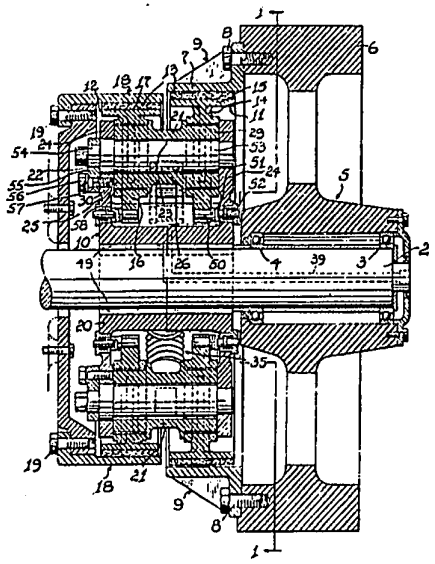


Fig. 2

SHEET 3

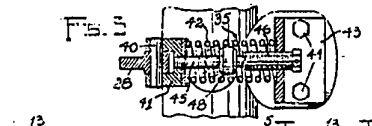


Fig. 3

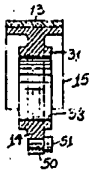


Fig. 5

Fig. 4

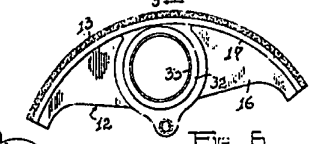


Fig. 6

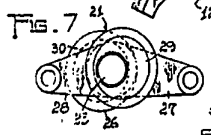


Fig. 7

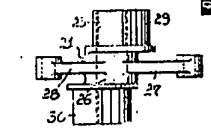


Fig. 8

Fig. 9

Fig. 10

H.M.S.O. (M.F.P.)